



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

SUMMER-2024	
Exam Seat No.:	
Academic Year:2023-2024	Semester:IV
Class:SY	Program:B.Tech
Branch Code:ADS/COM/CSD/INT	Pattern:2022
Name of Course:Applied Mathematics-III	Course Code:SMH222111
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 4 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicate the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.
6. Use of non-programable calculator is allowed.

Question No. 1 Attempt following Question

- 1a) Calculate first four central moments from the following data (6) CO1

x	0	1	2	3	4	5	6	7	8
f	1	3	8	26	32	26	8	3	1

Also find coefficient of Skewness & Kurtosis.

Question No. 2 Attempt following Question

- 2a) Find the value of k if the probability mass function is given by (6) CO2

x	-3	-2	-1	0	1	2	3	4	5
P(x)	3k	2k ²	2k ²	2k-k ²	k ²	2k	k/2	k/2	5k ²

Also find

- i. $P(|X| \geq 2)$
- ii. $P(-1 \leq X < 4)$

Question No. 3 Attempt following Question

- 3a) Given the following probability distribution of X: (5) CO2

x	-3	-2	-1	0	1	2	3
P(x)	0.05	0.10	0.30	0	0.30	0.15	0.10

Compute:

- i. $E(X)$
- ii. $E(X^2)$
- iii. $E(2X \pm 3)$
- iv. $V(2X \pm 3)$

OR

3b) If $dF = kx^2 e^{-x} dx; x \geq 0$ Find k, mean and variance. (5) CO2

3c) Find the Moment Generating Function of the r.v. X having pdf (5) CO2

$$f(x) = \begin{cases} x; & 0 < x < 1 \\ 2 - x; & 1 < x < 2 \\ 0; & \text{otherwise} \end{cases}$$

Also find Mean.

OR

3d) If X represents the outcome when a fair die is tossed. Find the Moment Generating Function of X & hence find $E(x)$ and $V(x)$. (5) CO2

3e) Find $E(X)$, $E(X^2)$ and $V(X)$ for the following probability mass function (6) CO2

$$P(X = x) = \begin{cases} {}^nC_x p^x q^{n-x}; & x = 0, 1, 2, \dots, n \\ 0 & \text{Otherwise} \end{cases}, q = 1 - p$$

OR

3f) Find $E(X)$, $E(X^2)$ and $V(X)$ for the following probability density function (6) CO2

$$f(x) = \frac{1}{b-a}; \quad a < x < b$$

Question No. 4 Attempt following Question

4a) On an average a box containing 10 articles is likely to have 2 defectives. If we consider a consignment of 100 boxes, how many of them are expected to have three or less defectives? (5) CO4

OR

4b) The mean and variance of Binomial distribution are 6 & 2 respectively. (5) CO4

Find $p(r \geq 1)$

4c) Number of road accidents on a highway during a month follows a Poisson distribution with mean 5. Find the probability that in a certain month number of accidents on a highway will be (5) CO4

- i. Less than 3
- ii. Between 3 and 5
- iii. More than 3

OR

4d) A car hire firm has 2 cars which it hires day-by-day. The number of demands for the car on each day is distributed as Poisson distribution with parameter 1.5. Calculate the probability of days on which neither car is used and for the days on which demand is refused. (5) CO4

- 4e) In a certain city 4000 tube lights are installed. If the lamps have average life of 1500 burning hours with standard deviation 100 hrs. Assuming normal distribution (6) CO5

- How many lamps will fail in first 1400 hrs.
- How many lamps will last beyond 1600 hrs. [$A(z=1)=0.3413$]

OR

- 4f) Let $X \rightarrow N(4, 16)$. Find (6) CO5

- $P(X > 5)$
- $P(6 < X < 8)$
- $P(X < 2)$ [$A(z=0.25)=0.0987$, $A(z=0.5)=0.1915$, $A(z=1)=0.3413$]

Question No. 5 Attempt following Question

- 5a) Find Karl Pearson's coefficient of correlation between sales & expenses of the following ten firms (5) CO3

Firm	1	2	3	4	5	6	7	8	9	10
Sales('000 units)	50	50	55	60	65	65	65	60	60	50
Expenses('000 Rs.)	11	13	14	16	16	15	15	14	13	13

OR

- 5b) Calculate Karl Pearson's coefficient of correlation from the following data using 20 as the working mean for price and 70 as the working mean for demand (5) CO3

Price	14	16	17	18	19	20	21	22	23
Demand	84	78	70	75	66	67	62	58	60

- 5c) Calculate Spearman's coefficient of rank correlation for the following data scores in psychological tests(X) & arithmetical ability(Y) of 10 children. (5) CO3

child	A	B	C	D	E	F	G	H	I	J
X	105	104	102	101	100	99	98	96	93	92
Y	101	103	100	98	95	96	104	92	97	94

OR

- 5d) From the following data, calculate the coefficient of rank correlation for tied ranks between X & Y. (5) CO3

X	32	35	49	60	43	37	43	49	10	20
Y	40	30	70	20	30	50	72	60	45	25

- 5e) The following data give the experience of machine operators and their performance ratings as given by the number of good parts turned out per 100 pieces: (6) CO3

Operator	1	2	3	4	5	6	7	8
Experience(in yrs)	16	12	18	4	3	10	5	12
Performance ratings	87	88	89	68	78	80	75	83

Calculate the regression line of performance ratings on experience & estimate the probable performance if an operator has 7 yrs experience.

OR

- 5f) For a particular product, the sales(Y) and the advertisement expenditure(X) for 10 yrs, provide the results (6) CO3

$$\sum X = 15, \sum Y = 110, \sum XY = 400, \sum X^2 = 250, \sum Y^2 = 3200$$

Find the regression line of Y on X and the estimate of Y when X=10.

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